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UNITED STATES DEPARTMENT OF AGRICULTURE  
WAR FOOD ADMINISTRATION  
FARM SECURITY ADMINISTRATION

Reserve

Montgomery 4, Alabama  
November 16, 1944

To: Mr. Ernest Morgan, Regional Director

From: Michael L. Mascia, District Engineer

Subject: FSA's experience in the Construction of Cotton Houses  
Region V

General:

In the spring of 1939 Mr. Baird Snyder, Chief Engineer of the FSA, suggested that this region experiment with cotton duck in its housing program. The matter was discussed with you and you directed us to prepare the necessary designs.

The Marketing Section, A.A.A., U. S. Department of Agriculture, had been experimenting for several years with cotton duck in building construction and had issued a pamphlet in January 1939, titled "Diversion of Cotton and Cotton Products from their Normal Channels of Trade, (Part I- Houses and Other Structures)" by Lawrence Myers, E. H. Omohundro and N. B. Slant describing said experiments. Mr. S. P. Stewart, Chief Architect of the Chief Engineer's office, working with Mr. E. H. Omohundro, provided us with the necessary technical data which was used as a basis of our designs, and also assisted us in securing the cotton duck from the Department free of cost. In May 1939 you secured the necessary funds for us and we started construction in Coffee County, Alabama, of one unit.

Cotton fabric, or duck, has long been used by the United States Navy as a water proof, sun proof and spot proof ship decking. Experiments with cotton material for building purposes have shown that cotton duck is free of curls and buckles, and is flexible and weather proof. It is easily treated to make it fire-resistant, and the Bureau of Fire Underwriters accord it a favorable rating. Because of its low thermal conductivity, cotton is an excellent insulating material. It has been demonstrated in tests by the U. S. Bureau of Standards that cotton is superior in this respect to many building materials and equal to rock wool.

During construction of this first unit, Mr. E. H. Omohundro, mentioned above, and Mr. Harry Steidle of the Douglas Fir Plywood Association, inspected the work and gave us the benefit of their expert advice. We were impressed with the results of the first unit and we subsequently constructed the following additional structures; one other house in Coffee County, an office building at Escambia Farms Project near Blackmon, Florida, a roof at Prairie Farms near Shorter, Alabama, and six labor shelters at Pahokee, Florida on our Agricultural Workers Camps.

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Construction Details:

The structural phase of our regular frame dwelling was retained. The exterior walls and roof were covered with smooth hard material as a base for the cotton covering. Realizing that the covering should have a smooth backing of sufficient strength, we selected the 3/8" plywood board for the exterior wall and sheathing.

The most important problem, of course, was the selection of canvas duck which would afford several valuable characteristics; namely, Fire resistance, imperviousness to moisture and durability. In selecting canvas duck a product of medium weight and texture was obtained. The weight of the material was approximately 23 ounces per square yard with a weave of four ply warp and four ply filling and with a breaking strength of approximately 350 pounds. The general requirements for the duck selected were:

- (1) Uniformity- free from defects which would mar its appearance.
- (2) Treatment against fungus growth and other detrimental substances, and to provide water resistance.
- (3) Flexibility of material to remain same as untreated duck.
- (4) To show no tackiness during tests of low and high temperatures.
- (5) Not to show any deterioration after test of heat applied at 150° F. for 72 hours and allowed to cool in room temperature.
- (6) Duck to be treated so that after torch was removed from specimen, no flame was present after two seconds.

The application, of course, was also an important consideration. Applying the canvas to the plywood surface requires a good grade of glue. A formula adopted by the U. S. Navy in their shipbuilding specifications was used. Glue may be applied by brush, pressure air guns or glue wheels. Care must be taken in keeping an even thickness of glue so that ridges and bumps will be prevented.

In laying the canvas over the glued surface the operation should begin at the bottom of the surface, laying a horizontal strip the full length of the wall. Too much precaution cannot be taken at this stage. Air bubbles and pockets will cause a loosening of the canvas and eventually create sagging. All succeeding strips of canvas should be laid in similar manner with a lap joint of at least 4 inches.

Canvas roofing is applied in the same manner as for the sidewalls with the exception of the lap. (The roofing lap should be 2½ inches instead of 2 inches).

The surface may be painted in the same manner as a wood surface with the same grade of paint.

There are attached plans, details and specifications which indicate the method used in constructing the units in Alabama and Florida.

Cost:

The two cotton houses in Alabama each had 933 square feet of floor space, five rooms and running water in the kitchen (no bath). These units

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each cost approximately \$1300 plus \$150 for cotton duck which was donated by the Surplus Commodities Administration - or a total of \$1450 or \$1.55 per square foot. The unit at Escambia Farms was completed in September 1939 and consists of five rooms and bath. It was contracted for \$1850, the contractor furnishing all materials. This unit had 850 square feet or a unit cost of approximately \$2.20 per square foot, including bath. These unit costs compared favorably during period of construction with wood and masonry units.

#### Results:

No maintenance was done on the two dwellings in Coffee County, Alabama to test the durability of the cotton duck. After five years the cotton duck was still in good condition, except that both units required a coat of paint and the roof on each unit had developed a split in about two places. This condition can easily be remedied by placing another piece of cotton duck where splitting has occurred. No splitting was seen on the sidewalls. Mildew developed on the sidewalls of the unit on the Elba-Troy Highway, due to shrubs being planted too close to the house. The labor shelters in Florida which were painted after three years were in excellent condition when inspected last winter. Cotton duck, like wood, requires periodic painting. If properly maintained the cotton duck should have a considerable life, lasting as long or longer than any other component parts of the house. In general, our experience indicates that a coat of paint every four years would be required. The Coffee County unit, which was painted by the owner, took about seven gallons of paint or an outlay of \$25 for the sidewalls. This unit has an asphalt shingle roof which the owner recently installed for about \$70. He stated, however, that when he removed the roof duck it was in good condition and that had he known this before he purchased the shingles he would have repaired the roof and gotten several years more service out of it.

#### What Tenants Think of Cotton Duck Houses:

The owner of Unit No. 113 on the Elba-Troy Highway, Mr. C. W. Hall, was not at home; his daughter, however, said they were well pleased, except for the roof condition, and that the house was cooler in summer and warmer in winter than a comparable frame house.

Mrs. E. H. Wise, wife of the owner of the other unit, stated that she thought it was the best house in the neighborhood; that the people came there during a storm because they thought it was so strong that it might roll over, but wouldn't collapse. They were, of course, thinking of the plywood frame. She also stated that it was cooler in summer and warmer in winter than any frame house and that the fireplace in the living room actually heated the bedrooms. Mr. E. H. Wise spoke of the house in glowing terms and said he thought that when he passed on it would "still be there" for his children and grandchildren to enjoy - and "they wouldn't have to chop much wood in the winter-time."







Conclusion:

The war effort is demanding the entire output of cotton duck, and it is therefore not available for our use. However, it should be plentiful after the war. Our experience with cotton duck houses for the past five years indicates -

(1) That cotton duck has longevity if properly maintained and will last as long as any of the other component parts of the house.

(2) The high insulating value of the cotton is obvious as contrasted with frame or masonry construction. People who have lived in the cotton units and others who have inspected and visited them attest to this fact.

(3) It has been the policy of the Administrative and Engineering departments to experiment with various types of construction in a search for durable and inexpensive farm structures. In this connection we have had the opportunity to construct wood, steel, masonry, plywood, rammed earth and cotton duck units. The cotton duck units have proven satisfactory. We believe that cotton duck houses should be seriously considered in our post war farm construction, along with all other types.

Michael L. Mascia

Attachments







## SPECIFICATIONS FOR APPLICATION OF COTTON DUCK

### EXTERIOR WALL FINISH

Exterior walls shall be covered with Douglas Fir Plywood (Plyscord) 3/8" thick, 24 inch by 96 inch and 48 inch by 96 inch, moisture resistant, and applied as indicated on drawings. Plywood shall be applied with exterior grain running parallel with length of wall. Joints shall be made only on bearings and nailed to each bearing in the following manner:

Vertical joints shall be nailed near edges with 6d light barbed car nails with flat counter-sunk heads, spaced not less than 5" o.c. Nail plywood at all other bearings, including the bottom and top horizontal joints of each sheet, with nails spaced 8" o.c. Vertical joints shall be alternated so that there will be one width of plywood between joints.

After plywood has been nailed to stud framing, the exterior face shall be completely covered with No. 6 flame resistant treated cotton duck, 32" width. The cotton duck covering shall be laid flush with the bottom of first course of plywood and applied horizontally.

Flame resistant cotton duck shall be applied as follows:

The surface to which the duck is applied shall be thoroughly cleaned, all nails tightly driven up and spread with a layer of bedding cement. This cement shall be made from the same basic materials as that used in making the cotton fabric fire resistant, and must be conducive to a good bond. A film of bedding cement about 1/64" is required. While the bedding cement is still tacky, the duck shall be applied, being stretched slightly and rolled down.

The bottom edge of first course of duck shall be tacked approximately 6" o.c. Head laps shall be at 2", and where end laps are necessary they shall be not less than 5".

All courses of duck shall be laid to a straight and uniform line.

### PAINTING:

Canvas on roof areas and exterior walls shall receive one (1) coat of paint having fire, water, mildew and weather resistant properties, which will insure the retention of the original qualities of the flame resistant cotton duck. The paint for roof canvas shall be green and for exterior walls light cream.







ROOF SHEATHING AND COVERING:

Sheath solid over roof rafters with Douglas Fir Plywood sheathing 3/8" thick (Plyscord) 3 ply 48" x 96" - moisture resistant. Sheathing shall be applied with exterior grain of plywood running perpendicular to direction of rafters. Joints shall be made only on bearings, and nail to rafters along edges at vertical joint with 6d light barbed car nails with flat counter-sunk heads. Nails shall be spaced not less than 6" o.c. along edges and not less than 8" o.c. at other bearings. Vertical joints of sheathing shall be alternated so that there will be at least one width of sheathing between joints.

After Plywood Sheathing has been thoroughly nailed to rafters, the top surface of plywood shall be cleaned and then completely covered with No. 4 flame resistant treated duck. The cotton duck shall be carried over the edges of plywood at eaves and rake and lapped and tacked in place as indicated on drawings. Flame resistant duck shall be applied as follows:

The surface to which the duck is applied shall receive a layer of bedding cement. This cement shall be made from the same basic materials as that used in making the cotton fabric fire resistant, and must be conducive to a good bond. A film of bedding cement about 1/64" is required. While the bedding cement is still tacky the duck shall be applied, being slightly stretched and rolled down. The duck shall be 42" in width and laid horizontally on plywood. Head laps shall be not less than 2½". All seams shall be thoroughly bedded in cement and rolled. (Color of roof canvas shall be green).

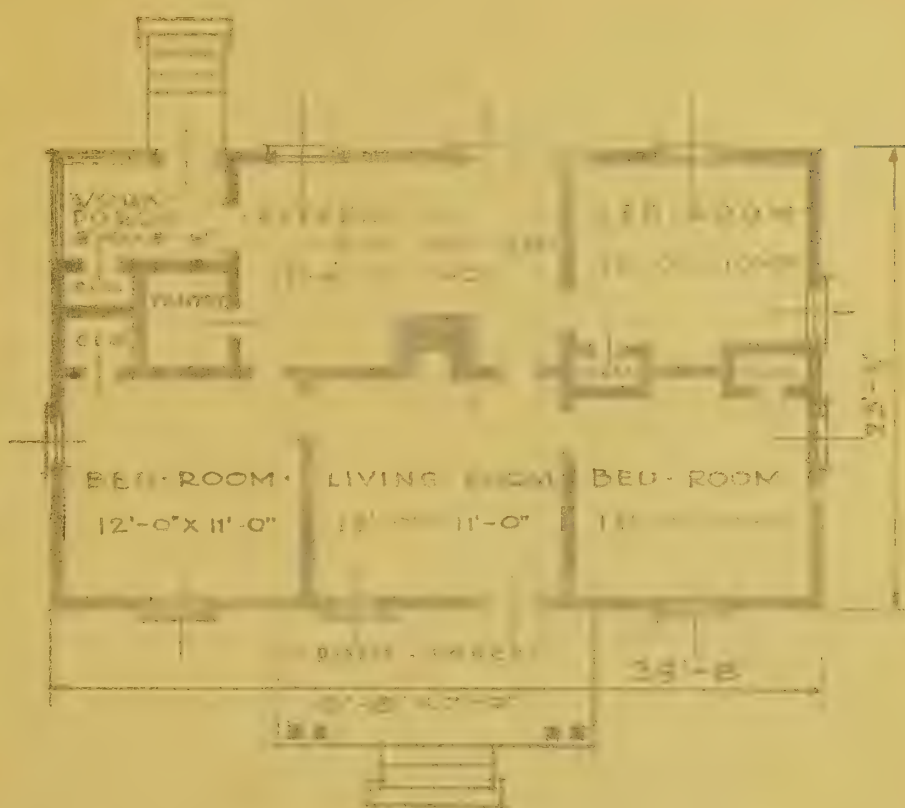








FLOOR AREA  
933 SQ. FT.



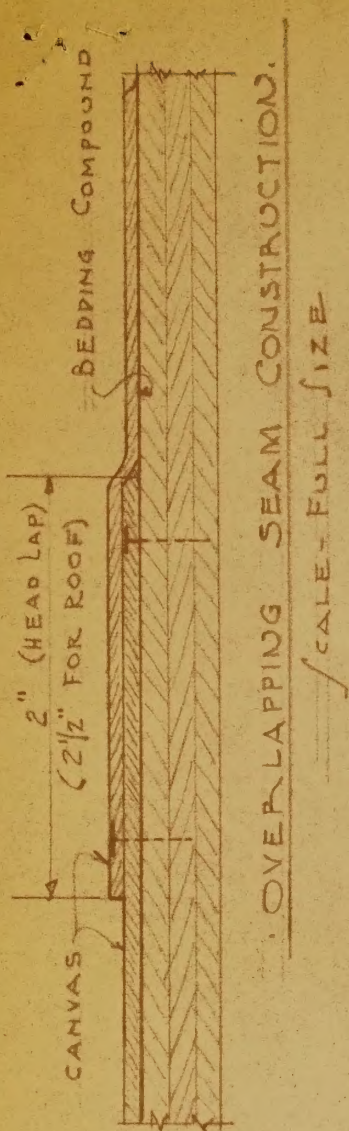
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.....FIVE · ROOM · DWELLING.....PLAN N° H-3B  
 · FARM · SECURITY · ADMINISTRATION ·  
 · DISTRICT · 2 · · · REGION · 3 · · · · · MONTGOMERY , ALA.

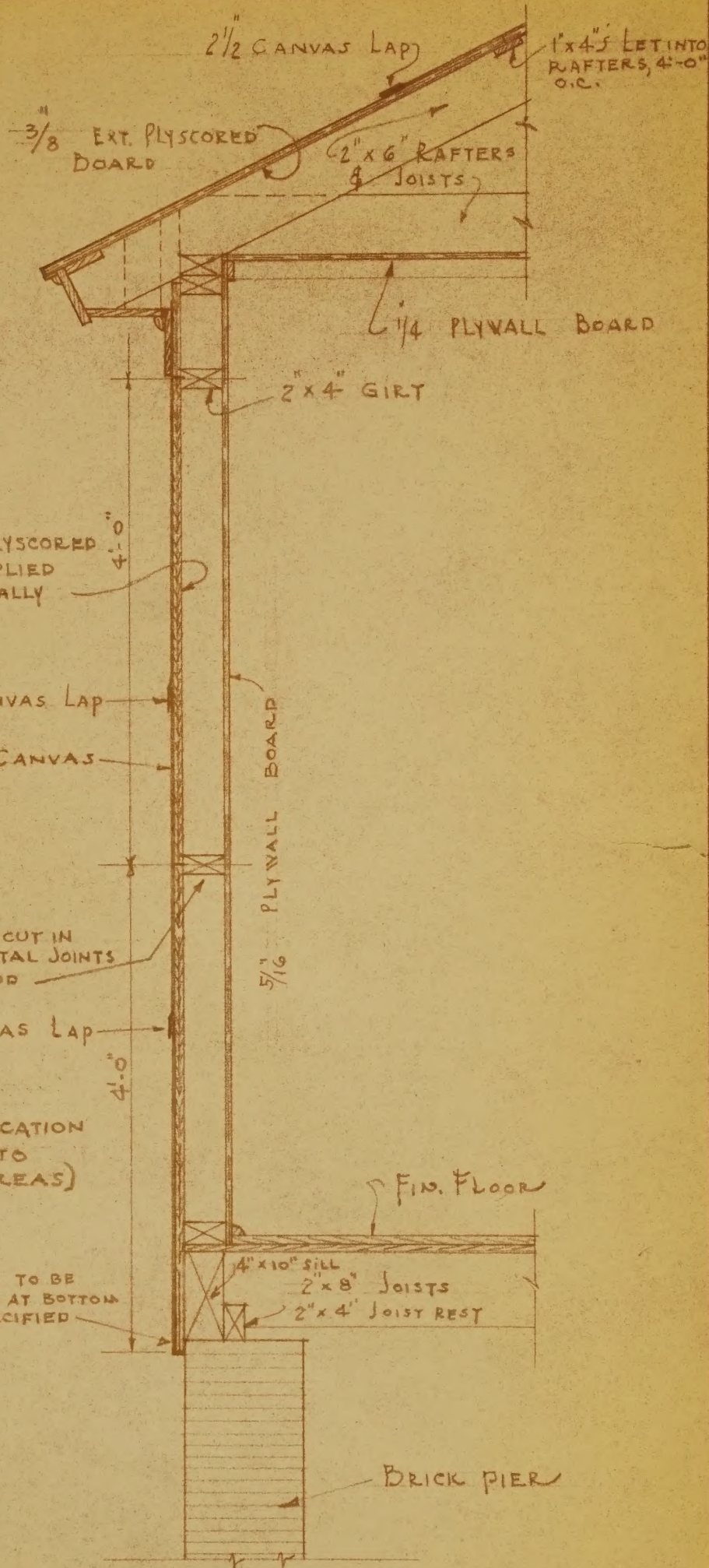








# WALL SECTION (INDICATING METHOD OF APPLICATION OF PLYWOOD AND CANVAS TO EXTERIOR WALLS & ROOF AREAS)

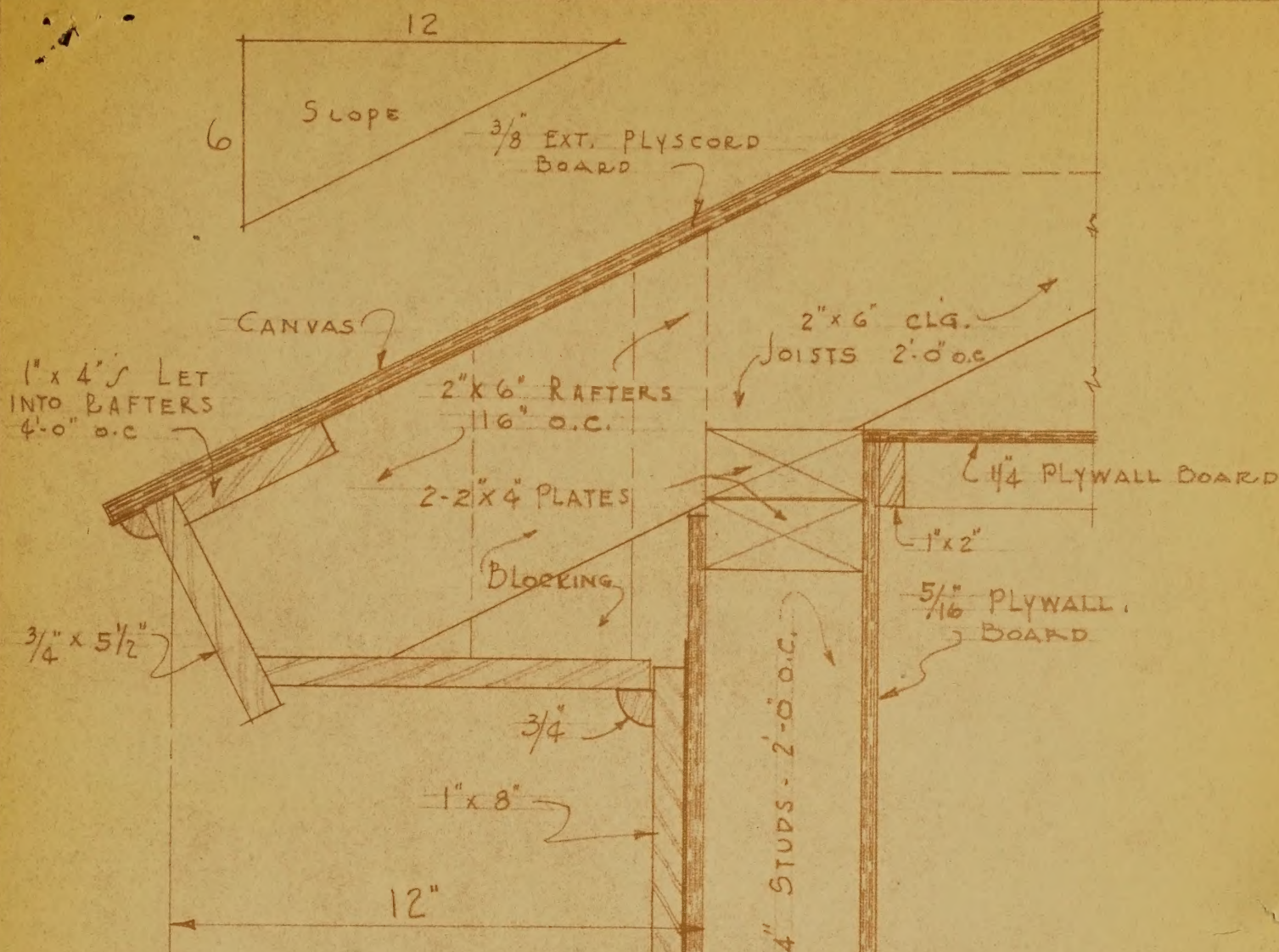


NAME DETAILS	
COUNTY AS ASSIGNED STATE	
FARM SECURITY ADMINISTRATION REGION 5—DISTRICT 2—MONTGOMERY, ALA.	
Date By	Drawn By H.H.J.
Checked By	Date
Approved By M.L.M.	Sheet









## TYPICAL WALL SECTION

SCALE 3" = 1'-0"

(CANVAS COVERED EXTERIOR WALLS & ROOF AREA'S)

$\frac{3}{8}$ " EXT. PLYSCORD BOARD

CANVAS

NAME - DETAILS	
COUNTY AS ASSIGNED STATE	
FARM SECURITY ADMINISTRATION	
REGION 5 - DISTRICT 2 - MONTGOMERY, ALA.	
Date By	Drawn By <i>M.H.J.</i>
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